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METEOROLOGICAL OFFICE
INVESTIGATIONS DIVISION TECHNICAL NOTE NO 2

METEOROLOGICAL CONDITIONS ON CONCORDE 002 FLIGHTS 114 and 115, 16 JULY 1971

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1. FLIGHT DETAILS This study is concerned with sections of the flights above 40,000 ft. The high level sections of both flights began and ended about 60 miles north of the Scillies, the track being almost due south to about 47N and looping south-eastwards over Biscay before turning north north west and returning to the starting point. Flight 114 was above 40,000 ft from 1134 to 1225 GMT and flight 115 from 1641 to 1737 GMT on 16 July 1971.

2. SYNOPTIC SITUATION

The surface weather pattern was slow moving with a well developed high in mid-Atlantic, a deep low near Stockholm and a weak low area over Spain. Thus a fairly strong northwesterly airstream affected the northern half of the UK with a weak cold front moving southwards and crossing the Scilly Isles around 1200 GMT.

At upper levels the surface pattern was duly reflected with strong north-westerlies over Scotland and the North Sea but light winds over the Concorde routes.

3. METEOROLOGICAL MEASUREMENTS ON CONCORDE 002

For these two flights BAC provided computer print outs at one second intervals of the following parameters:

a. Raw Data
(1) Nose probe static pressure
(2) Nose probe total pressure
(3) Intake 2 total temperature
(4) Total temperature from probe under nose
(5) Normal acceleration at centre of gravity
(6) Normal acceleration at nose (trident 6-501-11)
(7) Angle of incidence
(8) Several other aircraft control settings

b. Output from Air Data Computer

(1) Pressure altitude
(2) Calibrated Air Speed
(3) Mach number
(4) Ambient temperature

4. The computer output was produced by a "quick look" programme which selected and printed data stored on magnetic tape, taking the next relevant reading after a given one second time. The readings of the various parameters are not therefore strictly synchronous, some of the raw data coming from the early part of a one second interval and the ADC output from a late part of the interval. The calibration corrections are made using a simplified method based on straight line segments.

5. Selections of the above parameters are shown for flight 114 in figure 1 ab (1241 - 1251 BST) and flight 115 in figure 2 (1801 - 1805 BST),

(No copies of Figs.)

figure 3 ab (1816 - 1824 BST) and figure 4 a b c d (1828 - 1837 BST). Comments on some of the features of the plotted curves are given below.

6. HEIGHT The large oscilliations plotted (eg fig 2, 1803 BST) are not real, but are erroneous values printed during change over from one fine scale reading to the next. Similar errors occasionally occur in other parameters, and gaps have been left in the plotted curves. It is proposed to use height readings from the CREUZET meter rather than ADC output, in future.

7. TEMPERATURE The graphs for ambient temperature shown in figures 1 to 4 differ in type from those presented for example in Note de Depouillement Perf No 38 for Concorde 001 flights 105, 109 and 121. The bit size for 002 is 0.6 - 0.7°C but finer scale oscillations are shown for 001. For 002 flight 115 the largest ambient temperature gradient given by ADC output was 2.6°C in 6 secs (during climb - not shown in fig 2-4). For 001 flight 121 there are several changes of 4°C or more in a few seconds. One second printouts for eight other 002 flights (totalling $3\frac{3}{4}$ hours above 40,000 ft) are available; the only notable temperature gradient was 4°C in nine seconds ($5\frac{1}{2}$Km) on one occasion.

8. Examination of radiosonde ascents in the area, allowing for radiation correction, suggests that the temperatures at 100 mb in the Biscay area was fairly uniform at -56°C. Flight 115 temperatures near 100 mb were about -63°C. The Mach number was about 2.0 and at this speed the temperature discrepancy of 7°C is in agreement with the results reported by J Briggs in 'Reliability of Ambient Air Temperatures as determined by Concorde', 18 Aug 71. It is believed that this discrepancy will largely be removed when new pressure errors are used in the calculations.

9. TURBULENCE Accelerations at the nose were generally greater than those at the centre of gravity, and were notably so from 1803 to 1805 (figure 2). Subjective assessments of turbulence are made by the crew on a scale in which "moderate" corresponds to 0.25 to 0.5g. On 29 flights between 6 June and 26 Oct 1971, flying time above 45,000 ft was 21 hr 13 min of which 2% was rated as slight turbulence and 4% as moderate turbulence, but on flight 115 there was a report of 22 minutes moderate turbulence from 1801 to 1823 BST. A summary of the turbulence reports is at Annex 1.

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